

Observations on the breeding of the Sandgrouse *Pterocles alchata* and *senegallus*

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SUMMARY

Observations on 23 nests of *Pterocles alchata* and 5 nests of *P. senegallus*, found between 4th June and 18th July, 1960 in an area south-east of Baghdad, Iraq, are described, including details of the incubation and its share between the sexes, as well as some remarks on the nest, clutch-size and laying.

What is taken to have been the watering of the young by the male, bringing water in his belly feathers, was once observed for a brood of *P. senegallus*.

The length of the breeding season and lack of breeding success are also mentioned, as well as the food of *P. senegallus*.

INTRODUCTION

Although unable to make an exhaustive search of the literature, I have not found anything except essentially casual references to the breeding of sandgrouse in the wild. Most of the standard works on the birds of the areas in which sandgrouse occur, describe the eggs, nests and breeding habitats of some or all species, but go very little further; and in this connection I refer to such authors as Bannerman (1931), Archer and Godman (1937), Bates (1930), Cave and Macdonald (1955), Hume and Marshall (1879), Jackson (1938), Meinertzhagen (1930, 1954), Praed and Grant (1952), Roberts (1940), Stuart Baker (1935) and Witherby *et al.* (1940). For Iraq itself the only reference to the breeding of these species is by Ticehurst *et al.* (1921-2), where there is some conflict between different accounts. At the same time most authors mention other aspects, such as the share of incubation by the sexes, the incubation period and care of the young, without referring to the observations on which their statements are based. In particular there is doubt as to how the parents provide the young with water, if they do so at all, though recent expressions of opinion (Meinertzhagen, 1954; Hüe and Etchécopar, 1957) have been that the idea of the male bringing water in his belly feathers is fantasy.

On the other hand I am grateful to Mr. D. Goodwin for referring me to papers by Meade-Waldo (1896, 1897, 1906) and St. Quintin (1905) on the breeding of certain species in captivity. These accounts are the only ones which I have found, not only giving details of incubation, but also saying quite precisely that the male brings water to the young in its feathers.

In view of this apparent lack of recorded observations in the wild, the following notes on the breeding of *Pterocles alchata* and *Pterocles senegallus* in an area near Baghdad in the summer of 1960 may be of interest.

BREEDING HABITAT

The area was about 40 km. south-east of Baghdad on the eastern side of the road to Kut and from 2 to 5 km. distant from the road. Here the land is absolutely flat, in summer time a desert of hard, baked clay with insignificant sandy or finely gravelly patches, only interrupted by low irregular ridges which represent the remains of canals built by ancient civilisations. Between these ridges the desert is often totally barren without a single plant over many acres, but in places the Arabs are able to use areas where the winter rains formed shallow flashes, for cultivation and by May when the sandgrouse breed, these ploughed-up areas are either covered

with barley, barley stubble or low, thorny or prickly, xerophytic plants. Nearer the Kut road this cultivation is continuous and assisted by irrigation from the Tigris. One large area alongside the continuous cultivation, itself uncultivated, supported a thin scatter of low tamarisk and other woody plants.

Both species were breeding throughout this area and as far as I could judge, neither showed any preference for particular types of terrain. I found nests of both close to one another not only on the flat barren wastes, but also in the area supporting the thin tamarisk growth. I only saw one nest (of *alchata*) in the patches of old or new cultivation, but admittedly I hardly searched such sites at all. It was easiest for me in the limited time at my disposal to drive over the open desert and spot the sitting birds.

The birds were numerous in my study area and indeed over a much wider area, but could not have been called abundant or in really large numbers. In all I found 23 nests of *alchata* and 5 of *senegallus*, as well as some broods of both, and I think that this ratio is representative of the proportions of the two species in the area.

Broadly speaking, the area lies about 10 km. distant from the Tigris, though I never located it precisely in relation to the river: yet at the same time for much of the breeding season irrigation water occurred much closer to the nesting area. Some water was certainly available not more than 3 km. from some of the nests, but I have no idea whether the birds made use of it: in fact, I never watched the birds drinking and had no knowledge of where they did so nor of that aspect of their behaviour.

NEST

Many of the authors quoted say that the nest is a scrape. For instance, Meinertzhagen (1954), discussing *senegallus*, says: "The nest is a small scratching in absolute desert." Now, four of my five *senegallus* nests and fifteen of my twenty-three *alchata* nests were in natural hoof-marks unaltered by the birds. In the remainder the ground could have been scratched out slightly by the birds, especially in the case of the only four nests (all *alchata*) found alongside a small tuft of vegetation. No nest had a trace of material added by the bird (Ticehurst *et al.*, 1921; Allouse, 1953). I would conclude therefore that it is unusual for either species to prepare a nest, but that the birds normally select a suitable natural hollow or foot-print in which to lay their eggs. The foot-prints vary considerably in depth, probably depending on the state of the ground when the animal passed, rather than on the sort of animal, because I do not think they were formed by anything other than camels. The shallow ones were evidently so formed, but the oldest and deepest were merely shapeless or conical depressions, up to three inches or so below the general surface, and gave no clue to their origin. On the most barren desert which had not been disturbed except by the passage of solitary animals, it was worth while to follow a line of foot-prints because somewhere along it I often found a nest.

CLUTCH SIZE

Most authors agree that the full clutch is usually three eggs for most species of sandgrouse, including the two of this study, but "two or three

eggs'' are mentioned often enough and occasionally only two are credited to the birds (Meinertzhagen, 1954, generally and for *alchata*). For *alchata* I saw 1 x C/2, 15 x C/3 and for *senegallus* 5 x C/3, all being nests in which I saw the full complement repeatedly. Several other *alchata* nests were found with one or two eggs only, but had been destroyed on the next visit.

LAYING

The only reference found is by Meade-Waldo (1897) who says ambiguously that the eggs are laid "with the interval of a day between each". I believe this was intended to mean an interval of about 48 hours, as my own observations at one *alchata* nest suggest either this or irregularity, i.e. 48 hours between one pair and 24 between the next. The details are of interest. About 1000 on 7th June I saw a pair of birds on the desert by a line of foot-prints, but noticed no nest, though I looked along the foot-marks. At 1105, when again passing, the cock was standing on the open desert and the female was crouched in a foot-print on a single egg. Unfortunately I cannot be certain that the egg was not there on my first visit. At 1730 on 9th June two eggs were in the hollow, but neither adult was present. At 0604 on 10th June there were still two eggs, cold, and no sign of the adults, but to my surprise at 1032 the female was on the nest with three eggs. At the time I did not realise the obscurity of this point and subsequent opportunities of proving the routine failed by destruction of the nests, but two things seem evident, one, that the eggs are not laid particularly early in the day, and two, that they are not all laid at regular 24-hourly intervals.

INCUBATION

It is generally agreed that for all species of sandgrouse the female incubates by day and the male by night; but Meade-Waldo (1897, 1906) and St. Quintin (1905) are the only authors I have read who quote their own observations. Moreover, Meade-Waldo (1906) says that the change-over occurs about 5 p.m. It is also stated that incubation in the wild is perforce continuous, otherwise the eggs would be baked by the sun, since the temperature on the ground in full sunlight may well be 180–200°F. in the deserts where the sandgrouse breed (Archer and Godmen for *exustus*, 1937: Hume and Marshall, 1879, for the same species, quoting instances of finding eggs with the albumen semi-coagulated by the heat). Pitman's similar opinion for *alchata* is given by Ticehurst *et al.* (1921), who also quote Logan Home as saying that they sit very little. Certainly there has been some difference of opinion on this matter, perhaps arising from Sushkin's much quoted opinion for *Syrrhaptes paradoxus* (Bannerman, 1959) that development of the embryo is helped considerably by the sun's heat.

However, my own observations show beyond doubt that incubation is continuous. In *alchata* the male goes onto the eggs at about 1800, as I observed three times at three different nests. On each occasion the male which had been nowhere in sight, flew in and landed at varying (20–300 m.) distances from the nest: the female left and flew away directly from the eggs at 1750, 1804 and 1810 on the different occasions, while the male was still 30–60 m. away. The male then settled on the eggs from 3 to 15

minutes later and remained there till next morning, as I once proved by sitting alongside in my car the whole night. On three other occasions in the evening I found males incubating after 1800, twice as early as 1730 and twice at 1750. In the morning I often saw the sitting male before 0800 and four times at three different nests watched the change-over. Each time the female flew in from out of sight, landed about 200–300 m. away and ran up to the nest with hesitation, taking 6–28 minutes in the process, even flying to and fro at times, though this may have been caused by my being too close to the nest. It finally settled on the eggs at 0808, 0817, 0835 and 0837 on the different occasions, on three of which the male stayed on the eggs till the female was alongside, stepped off, waited at the distance of about 1 m. till the female was well settled and then departed for 500–600 m. or out of sight. On the other occasion it flew away when the female was 30 m. distant. Thereafter until the evening relief the female incubates. I once watched the female on her eggs from 0830 to 1400, and at another nest from 1300 till the evening change, during which periods she remained motionless, facing the brisk northerly breeze and with no signs of distress. She never left the eggs except when deliberately or accidentally disturbed by me (thrice) or on the approach of an inquisitive Arab (once). I am thus convinced that normally the eggs are never left once incubation has started, except perhaps for short periods at the change-over or when the bird is disturbed by passing animals or men. When animals or men on foot approach, the sitting bird leaves the eggs when they are 80–200 m. distance as I twice observed: but it seems to have little fear of a car, as I was repeatedly able to drive slowly right up to the nest and often the bird would only leave when I got out. Moreover I only found some nests when the bird flew up in front of the bonnet of the car.

For *senegallus* the routine is very similar. The male sits till 0930–1000 or thereabouts, when I twice saw the change-over at 0927 and 1018 respectively, the female having spent 5 and 20 minutes approaching, the second time being rather nervous and flying to and fro several times. The actual change took place as for *alchata*, the male staying on the eggs till the female was alongside, then stepping off the eggs, waiting for the female to settle and finally flying away out of sight after a short pause. The female then incubates until about 1900, when I witnessed one change precisely at that hour, the female leaving the eggs, calling, when the male was still 80 m. distant. I have no doubt that the male then continues to incubate till the next morning, as several observations showed that he was on the eggs late in the evening and always there first thing in the morning.

For neither species did I establish when continuous incubation started, but I suspect that until the last egg is laid, there is a period of less simple and regular behaviour than that suggested by my observations of fully incubating birds. For one thing once the female is on the eggs during full incubation I never saw the male approach the nest nor even suspected its presence within the range of ordinary observation. Thus I am convinced that for these two species there is no truth in the suggestion that the male supplies the sitting female with water by regurgitation (Meinertzhagen, 1954 for *senegallus*). Yet at nests in which I subsequently knew that a full clutch had not been laid or where I believed that the last egg had recently been laid, the male attended the female closely. The first nest which I

found was the C/2 *alchata*, mentioned above, and my attention was attracted by a group of five birds on the desert—four males and one female. The males kept walking around the female which eventually squatted on what proved to be the full clutch of two eggs. The males then flew away one by one, till a single one remained, still walking round the female which kept turning round on the eggs to face him, at times stretching out her head along the ground to point at him, or peering round over her shoulder to follow his movements. I saw a very similar occurrence at another nest with three eggs which was destroyed at my next visit. Further, at the nest mentioned above, when discussing the laying routine, the male at times evidently attended the female while laying took place, and it seems certain that on one night when there were only two eggs, they were unattended all night. I found a similar probability with one *senegallus* nest from which I watched the female fly away with the male at 1723: that nest was unattended at 1830 and the two eggs could well have been left uncovered all night. Thus I believe that until the last egg is laid, incubation only occurs by the female during daylight, of necessity to prevent overheating of the eggs, and that during that time the male often attends the sitting female closely.

INCUBATION PERIOD

Witherby *et al.* (1940) give (22) 23–24 (27) days under hens and 28 days in incubator for *S. paradoxus* and Meade-Waldo (1906) says 21–23 days for captive *alchata* and (1897) that the young are hatched on the 24th day. My own observations were too spasmodic to stand much chance of deciding this point and indeed I only knew one *alchata* nest which hatched for certain and that was the first one found. I have mentioned the circumstances of its discovery on 4th June at 0830, and that I believe that then the clutch had only recently been completed, probably within the preceding 24 hours. On 23rd June at 1720 I found two tiny young in the nest, certainly less than 24 hours old. On this slender evidence it may be that the incubation period in the wild is only about 19–20 days and somewhat shorter than quoted for captive birds.

THE YOUNG

I saw very many fewer young than I saw eggs and naturally had no chance of following the history of any particular brood. When very small, downy and obviously under a week old, the young of both species follow their parents about on the desert extremely closely, running right alongside the whole time, each parent with one chick, if there are two (I never saw a brood of three) and picking up their food independently. When feathered and a third to a half grown, they can fly quite strongly and I once saw one young *alchata* of this size with a small pack of adults and apparently behaving fairly independently. This would suggest support for Meade-Waldo's (1906) statement that the young quickly become independent, about the tenth day roosting separately.

My most important observation was of a brood of two *senegallus*, about a quarter grown and beginning to feather. I found the birds at 0820 on 15th July, photographed the young and drove off 100 m. to watch. The parents immediately returned and, each taking one chick, separated to

about 20–30 m. They then ran off steadily across barren desert, going further and further, at times feeding, till they entered an area with a scatter of low tamarisk and desert plants some 600 m. from where I first found them. By that time I had followed and was watching through binoculars from 250 m. I saw both young suddenly run into the shelter of separate plants about 50 m. or so apart and squat. The parents then joined one another and after running on for another 50 m., took wing at 0905 and flew away, calling. I then drove up to within 150 m. of where the young were and waited. At 0922 both adults returned, calling, and landed near the chick which had been accompanying the male. As they flew over, I remarked that the male was flying awkwardly and not with its normal ease. As soon as it landed, it walked to where the chick was with a waddling, open-legged gait and not in the usual manner in which each foot appears to be placed more or less in front of the other. The chick quickly appeared and ran up to the male which stood erect with back to the sun in a totally different way from the normal, rather horizontal stance. The chick stood between its legs. A minute or so later the second chick also ran up and both sheltered under the male in its shade. I was too far away to see details accurately and in any case the male had its back towards me partly obscuring the view, but I got the impression that both chicks were putting their heads up towards the feathers of the male's belly and lower breast. At 0926–7 one chick left the male and joined the female which had stood by at a distance of about 15 m. throughout the performance, and thereafter both parents, each with an attendant chick, proceeded to feed normally.

Personally I have no doubt that in seeing this I was witnessing the method by which the young are watered. It agrees as well as can be expected with Meade-Waldo's (*op. cit.*) and St. Quintin's (*op. cit.*) accounts of captive birds and Meade-Waldo's supplementary notes on field behaviour (1906). In this case the point which has worried critics (St. Quintin, *op. cit.*: Meade-Waldo, 1906: Archer and Godman, 1937) regarding the improbability of being able to transmit moisture in the feathers far in an arid climate, seems unimportant. At the worst the birds I saw were only 8–9 minutes in the air on their return flight and as they must presumably have spent a few minutes at the water, it is fairly certain that they did not have to fly for so long.

Apart from these observations, it has been pointed out to me by Mr. D. Goodwin that sandgrouse have bills which are in no way adapted for receiving food or water by regurgitation, which is normally presented as the alternative method for watering the young (Hüe and Etchécopar, 1957: Meinertzhagen, 1954 for *exustus*). I entirely agree with Mr. Goodwin and for myself do not believe that the habit of water carrying in the feathers can be seriously doubted any longer, particularly as it has already been described unequivocally by Meade-Waldo and St. Quintin.

GENERAL

There are a few further matters which deserve mention, although my observations on them were far from complete. The breeding season probably starts in late April or early May (Ticehurst *et al.*, 1921) and certainly lasts till late July or early August. I first went out to find nests on

4th June which must have been some weeks after the start of laying, at least for *senegallus* because on 7th June I found a newly hatched brood of that species. Though I saw no young of *alchata* until 23rd June, there were plenty of full clutches two and a half weeks earlier. It thus seems that Allouse's remark (1953), based on Ticehurst's records, that *senegallus* is a later breeder than *alchata*, is hardly correct. On the other hand I found three incomplete *alchata* clutches between 15th and 17th July, but I have no idea whether these were second broods [recorded for the species in captivity by Meade-Waldo (1906)] or replacements. I suspect the latter, however, because the hatching success seems to have been remarkably low. Out of all the nests found I was only certain that one of each species hatched and knew that most were destroyed. One *alchata* nest was probably destroyed by the passage of a flock of goats and sheep. Another *alchata* and one *senegallus* were destroyed over night and probably during darkness. Oddly enough the broken egg-shells suggested an avian predator, but it is difficult to suggest a likely species. Ravens (*Corvus corax*) certainly frequent the area, but only seldom. Of mammals there are two species of fox, commonly seen early in the morning, and no doubt several species of rodent, while reptiles are represented by one, and perhaps two, large species. The destruction of the *senegallus* nest which occurred between 1810 and 0525, was interesting because it was situated on a completely flat mud desert far from any possible lair of a predator and one would have thought that its discovery at night would have been most unlikely.

Finally Meinertzhagen (1954) says that *senegallus* is a species which is never found near or in arable land and does not take grain or smooth seeds. But a male and female, shot for me by a friend on 21st October, were both obtained in or at the edge of cultivation and both had their crops stuffed with barley, as identified for me at the British Museum. Moreover, as I have said before, they were breeding on the fringes of cultivation and often within sight of growing barley.

CONCLUSIONS

It seems worth summarising these points on which my observations are at variance with published statements or generally accepted ideas.

1. Neither *alchata* nor *senegallus* normally prepare a nest hollow and perhaps equally rarely add any material.

2. The clutch-size is three, rarely two.

3. Once incubation has started, perhaps after laying of the last egg, it is continuous and the eggs are normally not left uncovered. The male *alchata* incubates at night, from about 1800 to 0800 and the female for the rest of the daylight hours. In *senegallus* similar change-over occurs about 1000 and 1900.

4. In neither species was there any evidence for the male supplying the incubating female with water by any method.

5. In *senegallus* the male brings water to the young in its belly feathers, perhaps normally at about 0900.

6. The breeding of both species extends from early May till late July and *senegallus* does not seem to start nesting later than *alchata*.

7. It does not seem that *senegallus* is much less of a bird of the cultivation than *alchata*, and will certainly take grain.

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Note on some eggs and nests attributed to the Stork-billed Kingfisher, *Pelargopsis capensis* (Linne)

by MR. C. J. O. HARRISON

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When the eggs of the Stork-billed Kingfisher, *Pelargopsis capensis* (Linné), in the collection of the British Museum (Natural History) were examined, five clutches of small eggs were found which appear to have been wrongly attributed to this species. Since these clutches, with the relevant data, were used in the description of the eggs and nest of this species by A. O. Hume (1890) and referred to by later authors, it is necessary to re-examine them in the light of later knowledge in order to establish their correct identity.

Authentic eggs of *Pelargopsis capensis* are within the following size limits—length 39.9-34.2 mm., breadth 32.5-29.3 mm., average size 36.6 x 30.9 mm. (Baker 1934).

One clutch of the small eggs whose identity is questioned was taken by J. R. Cripps at Dibrughur (Dibrugarh), in Assam, on 27th April, 1880. This became part of the Hume collection (B. M. Reg. No. 91.3.20.7765-8) and a description was published in Hume's "Nests and eggs of Indian birds" (1890) under the species *Pelargopsis gurali* (now *Pelargopsis capensis*). The nest was in an 18 inch tunnel in the earth on the roots of a fallen tree. The eggs measure 29.25 x 27 mm., 27.25 x 25 mm., 29 x 26.75 mm. The original clutch contained four eggs. In the same account data are given for a clutch of the larger eggs whose authenticity was established by being collected together with a sitting bird.

Another clutch of small eggs was collected by C. Hopwood for H. N. Coltart's collection (B. M. Reg. No. 1961.1.304) at Mokka Choung,